

## 4.1 STREET GEOMETRICS

### 4.1.1 General Comments

This section describes the geometric requirements for each street classification: parkway/expressway, major arterial, minor arterial, major collector, minor collector, local collector, local residential, local commercial and local industrial. The requirements described herein are primarily based on safety considerations; therefore, standards that provide a greater degree of safety may be used within reasonable economic limits, but standards that provide a lesser degree of safety may not be used without approval from the City Engineer.

While every effort has been made to ensure the accuracy and completeness of these guidelines, the City of Goodyear shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents containing his or her signature.

#### A. Use of National Standards

##### 1. Geometric Design Standards

The American Association of State Highway and Transportation Officials (AASHTO) policies on highway design are approved references and are to be used together with this manual.

##### 2. Traffic Control Standards

All traffic control devices shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) prepared by the U.S. Department of Transportation, City of Goodyear Design Standards and Policies, Section 3.4: Bikeways, and Section 3.6: Traffic Signs and Markings.

#### B. Street Types:

The City of Goodyear has four basic types of streets: These are Freeway/Expressway, Arterial, Collector, and Local.

##### 1. Freeways

Freeways will be designed to safely handle very large volumes of through traffic. Direct access will be limited to widely spaced interchanges. Design, construction and operations shall be provided by the Arizona Department of Transportation.

### Expressways

Expressways provide for efficient movement of large volumes of through traffic. Direct access is limited to designated intersections.

### 2. Arterial Streets

Arterial streets with raised medians provide regional continuity and carry large volumes of traffic between areas of the City and through the City. Full access to abutting commercial and multi-family land uses is limited to median openings. Single-family residential developments may not have direct access to an arterial street.

### 3. Collector Streets

Collector Streets provide direct access to abutting land uses, handle local traffic, and provide access to the collector street system. Local streets normally will not be connected to arterial streets.

### 4. Local Streets

Local streets provide direct access to abutting land uses, handle local traffic, and provide access to the collector street system. Local streets normally will not be connected to arterial streets.

Deciding the location of local collector, residential, commercial and industrial streets is usually part of the development site planning process. Frequently, planning for local streets is influenced by the plans for adjacent developments which have recently been approved. The Development Policy Committee will review each preliminary proposal for development and will specify any changes needed to conform with previously planned and approved street alignments. The Development Policy Committee will also specify the classification for each street involved in the plan.

5. Following is a listing of each street classification followed by the number of the detail that depicts the standard street cross-section for that classification.

#### STREET CLASSIFICATION

City Center Arterial	G-3120
Scenic Arterial	G-3120
Arterial with Bike Path	G-3122
Major Arterial with Bike Path	G-3122
Major Collector with Bike Path	G-3124-1
Minor Collector with Bike Path	G-3124-1
Minor Collector with Bike Lane	G-3124-2
Major Collector Special Use with Bike Path	G-3124-3
Local Residential	G-3126

Street classifications are determined by location and/or intended use.

6. All developments shall provide for public arterial and collector streets at their normal alignments.

#### C. Street Names

Street names shall be consistent with the natural alignment and extension of existing streets and the "M.A.G. Address and Street Assignment Policy". New street names shall not duplicate in whole or in part, or be confusing with existing street names. The City Council reserves the right to modify street names to conform to City standards.

#### D. Intersections to Arterial Streets

Interior streets shall not intersect arterial streets other than at the 1/4 and 1/2 mile points of the arterial.

### 4.1.2 General Technical Information

#### A. Street Name Signs

1. All new developments shall provide for street name signs and posts at all intersections. The developer shall install these signs and posts at public street intersections upon payment of all applicable fees. Construction bonds will not be released until these fees have been paid.
2. Private streets shall be signed by the developer per Detail G-G-3140.

B. Survey Monuments

1. All developments shall provide survey monuments at section corners, street centerline intersections, street centerline alignment changes (P.C.'s or P.I. if it is within street pavement), and subdivision corners. For new building construction the City Engineer may not require, with prior written approval, replacement of monuments for areas outside the right-of-way.
2. All section corners, 1/4 corners, and center of section shall be a brass cap in a hand hole per MAG Std. Det. 120-1-A. All other required survey monuments shall be a brass cap on the surface per MAG Std. Det. 120-1-B. All existing monumentation shall be preserved both horizontally and vertically.

C. Irrigation Facilities

1. All new developments shall provide for continued and undiminished service of affected irrigation systems.
2. The developer is responsible for coordinating with Roosevelt Irrigation District/Buckeye Irrigation District for the design and construction of R.I.D./B.I.D. facilities.
3. Private irrigation facilities shall be located on private property and sized to carry at least the same flow as the existing ditch, or as may otherwise be directed by the City. The Engineer shall submit appropriate data to support the design.
4. Where there is need to cross public right-of-way, it shall be done at approximately 90 degrees and they must be tiled with R.G.R.C.P. in accordance with the criteria outlined in A.S.T.M. Specifications Section C 361.

D. Barricades

1. All new developments shall provide for barricades at all deadends and incomplete streets per M.A.G. Std. Dtl. 130-B.
2. New barricades shall be constructed per MAG Std. Det. 130-B modified with red and white reflectorized stripes using engineer grade reflective sheeting.
3. Barricades installed with phased construction may be relocated within the same development.

#### 4.1.3 Design Standards

##### A. Street right-of-way Requirements

The right-of-way requirements shown in Details G-3120 through G-3126 are based on the space needed for the street when it is constructed to meet ultimate development requirements. The right-of-way must also provide space for utilities, cut or fill slopes, sidewalks, bicycle paths, trails, traffic control devices and information signs, fire hydrants, landscaping, transit facilities and other public facilities that must be located adjacent to street pavements.

Right-of-way widths in excess of the standard widths may be required in special circumstances such as when:

1. Cut or fill slopes cannot be confined within the standard width;
2. Minimum sight distance lines on horizontal curves are not within standards;
3. Minimum sight distances at intersections are not within the standards;
4. Auxiliary lanes are to be provided.

##### B. Pavement Cross-Section Slopes

###### 1. Typical Street Cross-Sections

Undivided streets should have a normal crown that is a two-way cross-slope with the cross-section high point on the street centerline. Divided streets should have cross-slope on each pavement section. The high point of each slope on each pavement section shall occur on the edge of the pavement nearest to the median. Unusual conditions may cause cross-slope requirements to vary, but normally, the desirable cross-slope is 2%, with a maximum cross-slope of 3%. Any deviation from the desirable cross-slope is subject to review by the Engineering Department.

###### 2. Cross-Sections in Street Dip Sections

While dip sections are discouraged, where storm drainage runoff flows must cross the street, dip sections are needed. The pavements through the dip section should have a one-way slope (no crown), curbing and medians must not be raised, and cut-off walls shall be installed in accordance with City of Goodyear standard

details. Transitions back to normal street cross-slopes will be needed at both ends of the dip section.

## C. Medians

### 1. Median Widths

The width of a median is measured from back of median curb to back of median curb. If the median has no curb, the width is measured between the centers of the continuous, painted median stripes. In special circumstances, the Engineering Department may approve widths other than those listed, but in no case shall a median be constructed with a width less than 3 feet.

### 2. Paved Widths

A median less than 4 feet wide should be paved. The paved surface should be crowned and have the same cross slope as the street pavement. Acceptable paving materials are concrete pavers.

### 3. Unpaved and Landscaped Medians

Medians that are 4 feet or more in width are normally not paved. The grading of the unpaved areas should be as shown in Details G-3120 through G-3124-1. If a median is to be landscaped, it shall be not less than 5 feet wide.

## D. Curbs

### 1. Vertical Curbs

a. Vertical curbs are required for all streets except local residential streets (see Details G-3120 through G-3124-3). Vertical curbs may be used where roll curbs are specified if drainage considerations make such use desirable.

b. Vertical curbs with gutter are to be constructed in accordance with City of Goodyear standard details. Vertical curb and gutter type shall match the adjacent pavement slope to the gutter cross slope direction. The curb height shown on the standard detail is 6 inches, but the following variations may be used where appropriate:

- (1) Where fire lane or public maintenance vehicle access to abutting property must be provided over the curb, use City of Goodyear mountable curb and gutter.

- (2) If special drainage requirements make a higher curb necessary, the height may be increased to 8 inches maximum and the width of the gutter may be increased to 24 inches.

2. Roll Curb

Roll curbing is required for local residential streets except where vertical curb is required, and is to be constructed in accordance with MAG Standard Details.

3. Cut-Off Walls

In locations where dip sections are permitted to allow drainage flows to cross roadways, cut-off walls conforming to City of Goodyear standard details must be installed. Cut-off walls must be at least 3 feet deep and have a top that is flush with the pavement surface. The exposed portion of the cut-off wall will have the appearance of a ribbon curb, with the same width as the street's regular curb and gutter (see Detail G-3520). The cut-off walls must extend across the flow path in the dip section to protect the pavement structure during runoff flows from a 100-year storm. Transitions will be needed between the regular curbs and the cut-off walls at each end of the dip section.

4. Curb Returns

Vertical curb shall be used through the curb return from PC to PT regardless of whether the tangent curb sections are vertical or roll curb. All curb returns shall be provided with sidewalk from PC to PT of the same width as that provided for the sidewalk behind the tangent curb sections. If no sidewalk is provided adjacent to the return, behind the tangent curb sections, the curb return sidewalk shall be at least 4 feet wide. Sidewalk ramps are not required when sidewalk is not present.

- a. Curb Return Radii

All street intersections shall be constructed with concrete vertical curb returns and a single ramp per MAG Standard Details and the American Disabilities Act (A.D.A.).

- (1) The radii for curb returns measured to the back of the curbs shall be 20 feet for intersections that involve either a local collector street or local residential street.

- (2) The radii for curb returns measured to the back of the curbs shall be 35 feet for intersections that involve an arterial street.
- (3) The radii for curb returns measured to the back of curbs shall be 30 feet for all other street intersections.

E. Selection of a Design Speed

The design of geometric features such as horizontal and vertical curves will depend upon the design speed selected for the street. The choice of the design speed is primarily determined by the street classification. The design speed is the maximum speed for the safe operation of a vehicle that can be maintained over a specific section of a street when conditions are so favorable that the design features of the street govern.

F. Superelevation in Curves

Superelevation is discouraged on horizontal curves in the portion of the City outside the Environmentally Sensitive Lands area.

1. 0.02 ft/ft Superelevation  
Superelevation of 0.02 ft/ft may be used when the standard radius cannot be provided due to circumstances beyond the control of the engineer and the general alignment cannot be changed.
2. Superelevation Greater than 0.02 ft/ft  
Superelevation greater than 0.02 ft/ft may not be used except when approved by the City Engineer. In no case shall a superelevation exceed 0.06 ft/ft.
3. Transition for Superelevation
  - a. The length of superelevation transition shall be based on the superelevation rate and the width of rotation. The axis of rotation shall generally be about the pavement centerline. For superelevations, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.
  - b. With respect to the beginning or ending of a horizontal curve, one-third (1/3) of the transition should be on the curve and two-thirds (2/3) of the transition should be on the tangent pavement section.
4. Drainage on Superelevation Curves  
Whenever superelevation is allowed on a divided street, a storm drainage system to collect the runoff along the median curb shall be



provided. In no case shall nuisance water from the higher traveled way be allowed to cross the lower traveled way.

G. Horizontal Curves

Horizontal alignments should provide for safe and continuous operation of motor vehicles at a uniform design speed for substantial lengths of street. A horizontal curve is required when the angle of change in horizontal alignment is equal to or greater than one degree. The nature of the surrounding development and topography and the street classification will establish the factors that determine the radius of a curve.

1. Minimum Radii of Curvature

The minimum radius of curvature will be determined by the design speed or by the stopping sight distance.

a. Consideration of Stopping Sight Distance

When walls, buildings, bridge piers, cut slopes, vegetation, or other obstructions are near the roadway on the inside of a curve, they can block a driver's view of the road ahead. If they are too close, the driver will not have sufficient distance along the curved roadway to stop when a hazardous condition comes into view.

For design, the driver's eye is 3.5 feet above the center of the inside lane (the driving lane closest to the inside of the curve) and that the hazardous condition is an object 0.5 feet high in the center of the inside lane. The line of sight is assumed to intercept the view obstruction at the mid-point of the line of sight 2.0 feet above the center of the inside lane. The clear distance, "M", is measured from the center of the inside lane to the view obstruction. MUTCD depicts these relationships and a table of minimum stopping sight distances for various design speeds.

2. Reduced Design Speeds on Curves

The reduction of a street design speed on a curve should be avoided. However, where physical restrictions prohibit increasing the radius of the curve or the clear distance, "M", the design speed for the curved section may be reduced. In such circumstances, signing in accordance with MUTCD is required. The difference between the design speed for the roadway approaching the curve and the design speed for the curve shall not be greater than 10 miles per hour. The design speed for a curved roadway section must not

be reduced if the reduction would occur at the end of a long tangent or at any location where high approach speeds may be expected.

3. Compound Curves

Compound curves should be avoided. However, if site conditions make the use of compound curve unavoidable, the shorter radius shall be at least  $\frac{2}{3}$  the length of the longer radius when the shorter radius is 1,000 feet or less. Compound curves are not permitted when design speeds require the shorter radius to be greater than 1,000 feet.

4. Tangent Sections Between Curves in the Same Direction

On two-lane roads, tangent sections are needed between two curves in the same direction.

5. Tangent Sections Between Reverse Curves and Approaching Intersections

A tangent section must be provided between two curves that curve in the opposite direction. A tangent section must also be provided between an intersection and a curve. If the curve radii are at least 50% greater than the radii required by the design speed, the tangent sections may not be required, depending on grades, topography and vegetation.

H. Vertical Alignment

A vertical curve is required when grade changes are equal to or greater than 1.5%. All sections of a street's vertical alignment must meet passing and stopping sight distance requirements for the design speed established for the street. For further details, see the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

1. Longitudinal Street Grades

For parkways, expressways, and arterial streets the maximum grade is 6%, for collector and local streets the maximum grade is 9%. The minimum longitudinal street grade for all streets is 0.4%. Wherever possible, longitudinal street grades greater than or equal to the minimum grade shall be provided. Where necessary, grades less than 0.4% may be used. Therefore, the absolute minimum longitudinal street grade is 0.15%.

2. Combined Horizontal and Vertical Curves

When horizontal and vertical curves are combined, the horizontal curve shall lead and follow the vertical curve. For additional

information on this topic, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

## I. Intersections

Although all intersections share certain common elements, they are not subject to generalized treatment.

1. To minimize conflicts and provide for anticipated traffic movements each intersection must be evaluated with regard to its individual characteristics, and designed based on the following factors:

- a. Traffic factors such as capacities, turning movements, vehicle size and operating characteristics, vehicle speed, pedestrian movements, transit operations, and accident history.
- b. Physical factors such as topography, existing conditions, channelization requirements.
- c. Human factors such as driving habits, reaction to surprises, decision and reaction time, and natural paths of movement.

2. Angle of Intersection

A right-angle intersection provides the shortest crossing distance for intersecting traffic streams. It also provides the most favorable condition for drivers to judge the relative position and speed of intersecting vehicles. Where special conditions exist, intersection angles may diverge from a right-angle by a maximum of 2 degrees (4 degrees with approval of the City Engineer) on parkways, expressways, arterial streets, and major collector streets and by a maximum of 4 degrees (15 degrees with approval of the City Engineer) on minor and local collector streets, couplets, and local streets.

3. Alignment and Profile

Intersections occurring on horizontal or crest vertical curves are undesirable. When there is latitude in the selection of intersection locations, vertical or horizontal curvature should be avoided. A line or grade change is frequently warranted when major intersections are involved. If a curve is unavoidable, it should be as flat as site conditions permit. Where the grade of the through roadway is steep, flattening through the intersections is desirable as a safety measure.

4. Intersection Sight Distance

In order to provide the opportunity for vehicles on a stop-controlled intersection leg to safely cross or make left or right turns on to a non-controlled intersection leg, adequate sight distance must be provided. Two sight distance triangles may be drawn to represent the areas that must be free of all objects, vegetation and topography in excess of eighteen inches above the pavement on the stop-controlled intersection leg. Two methods may be used for determining the sight triangles.

MUTCD depicts the technique for determining the sight triangle utilizing the location of the driver's eye. MUTCD shows the sight triangle utilizing the right-of-way lines. Either method may be utilized by the engineer.

5. Valley Gutters at Street Intersections

- a. Concrete valley gutters (MAG Std. Detail 240) shall be constructed at all intersections where the drainage pattern requires them.
- b. Asphalt valley gutters are not allowed on public streets.
- c. Locations of Valley Gutters  
Valley gutters may only be used across minor and local collector streets, and local residential streets. Exceptions must be approved by the City Engineer.
- d. Valley Gutter Widths  
Valley gutters should be constructed in accordance with City of Goodyear standard details.

6. Turning Lanes

A separate turning lane permits separation of conflicting traffic movements and removes turning vehicles from the intersection area. Right turn lanes shall be provided on major arterial streets at all street intersections, and at driveways where warranted. For left turn lanes at signalized intersections, dual turn lanes should be considered when the turn volume exceeds 200 vehicles per hour, the opposing through volume exceeds 1,000 vehicles per hour, or the delay to left turning vehicles exceeds 45 seconds. Abrupt reduction of alignment and sight distance standards should be avoided. The length of these lanes depends on several factors and must be determined on a case-by-case basis and approved by the City Engineer.

7. Median Design

Raised medians are required on parkways, expressways, arterial streets, and couplets to separate traffic flows, channelize left turns and reduce conflicts. On collector streets, flush or painted medians provide space between the through traffic lanes for left turning vehicles.

a. Raised Medians

Raised medians, where required, must be provided in accordance with the applicable City of Goodyear standard details, with the appropriate median width as noted above.

(1) Spacing and Location of Median Openings

If a street has a raised median, it is not possible to provide an opening in the median for every street intersection or driveway location. Full median openings should occur at not less than 1/4 mile intervals on parkways, expressways, and major arterial streets. Partial median openings, which allow only left turns off the major street, are acceptable at 1/8 mile spacing. On minor arterials and couplets, full median breaks should be no closer than 1/8 mile intervals. In built up areas, where reasonable alternate access is not available, median openings may be provided at smaller intervals with the approval of the Engineering Department.

(2) Configuration of Median Openings

If the street intersection legs intersect at an angle of 88 to 90 degrees, the configuration of the median opening is to be determined by the information on Detail G-3224. If the streets intersect at an angle less than 88 degrees, the median opening configuration will have to be determined to the satisfaction of the City Engineer.

(3) Cross-Slope

The cross-slope in the median opening shall be limited to 0.02 ft/ft. Median openings on curves with superelevation exceeding 0.02 ft/ft will not be permitted.

- b. Flush Medians  
Flush, painted medians are required on major, minor and local collector streets.

#### 4.1.4 Street Access and Driveways

All driveways serving property abutting public streets in the City shall conform with the following guidelines:

##### A. Driveway Design

- 1. Width  
The width of a driveway shall be the width at the throat of the driveway exclusive of wings or return radii.
- 2. Distance between driveways  
The distance between the near edges of the driveways as defined by top of transition (Type MAG Std. Det. 250) or by curb return (MAG Std. Det. 251 or G-251).
- 3. Construction
  - a. Residential Driveways:  
With straight curb - Replace curb per MAG Std. Det. 250.
  - b. Commercial Driveways and Private Streets:  
Roll and straight curb - Replace curb per Detail G-3250 or G-3251.

- B. Notwithstanding the provision of these standards, where ample justification exists, the City may approve driveways up to a maximum width of 30 feet.

##### C. Driveway Spacing

Exhibit No. 10 lists the minimum driveway spacing measured from driveway centerline to driveway centerline, which is acceptable for the indicated types of land use.

A maximum of one driveway opening shall be permitted to a particular site or parcel from each of any one or two abutting streets. One additional driveway entrance may be permitted by the City Engineer when projected travel demands indicate it is in the interests of good traffic operation, and adequate street frontage exists to maintain the above guidelines.

##### D. Driveway Location Limitations

A new access driveway will not be allowed (measured to the driveway centerline):

1. Within 30 feet of any commercial property line except when it is a joint-use driveway serving two abutting commercial properties and access agreements have been exchanged between, and recorded by, the two abutting property owners.
2. When the total width of all driveways serving a property exceeds 50% of the curb line frontage.
3. Within 50 feet of the right-of-way line of an intersecting non-arterial street.
4. Within 100 feet of the right-of-way line of an intersecting arterial street.
5. Within 100 feet of an approved median opening location on an arterial street.
6. Less than the minimum spacing as established by Exhibit No. 10

E. Protection of Access

Except at approved access points, for proper control of driveway access, a vehicular non-access easement shall be granted to the City along all arterial streets when abutting property develops.

F. Residential Development Driveways

1. **Single Family Residential Development**  
Driveways serving single family residential units should be S-1 type driveways as shown on Detail G-3224. Only one driveway per lot street frontage is allowed. The minimum driveway length is 20 feet, measured from the face of the garage opening to the back of sidewalk or the back of curb if no sidewalk is provided.
2. **Multi-Family Residential Development**  
The M-1 and M-2 type driveways shown on Detail G-3254-1 are to be used to serve multi-family developments. Type M-1 is a low-volume driveway serving more than three off-street parking stalls for more than two dwelling units. Type M-2 is a high-volume driveway serving more than 50 dwelling units and is normally on a major collector or an arterial street. With the City Engineer's approval, type M-1 and M-2 driveways may be widened up to 10 feet on the egress side to provide for a separate left-turn lane. The minimum driveway length is 20 feet, measured from the entrance to the off-street parking area to the back of sidewalk, or to the back of curb if no sidewalk is provided.

### 3. Limitations on Residential Access

- a. Residential properties that have frontage on a local street as well as on an arterial or collector street shall only access the local street.
- b. In some instances, residential parcels fronting only on an arterial or collector streets may be given access if alternate public access is not available. When such access is allowed, the driveway must be circular or it must have a turn-around area to ensure that there is no need for backing onto the street.

### G. Commercial and Industrial Development Driveways

Driveways for commercial and industrial development are shown on Details G-3254-2 through G-3254-3. Detail G-3254-2 depicts the “CH” type driveways, and Detail G-3254-3 depicts the “CI” type driveways. The minimum length for a commercial or industrial driveway is 30 feet, measured from the entrance to the off-street parking area to the back of sidewalk or the back of curb if no sidewalk is provided.

#### 1. Commercial Driveways

The “CH” type driveway shall be used to serve commercial properties. A “CH” type driveway is to be used for driveways on arterials, major collectors, and high volume minor collectors, or at other locations when required by the City Engineer. The CH-2 and CH-3 type driveways are to be used at all access driveways opposite median openings.

#### 2. Industrial Driveways

The CH-1 type driveway shall be used to serve industrial properties. Except under unusual circumstances, other “CH” and “CI” driveways are not allowed in industrial areas. When the City Engineer allows them, the related requirements of commercial driveways shall apply. Generally, industrial access is not permitted on arterial or major collector streets; however, if the City Engineer allows such access, commercial driveway standards shall apply.

### H. Non-residential Driveway Grades

Driveway profile standards are illustrated in Detail G-3258.

### I. Deceleration Lanes



1. Deceleration lanes may be required on streets in conjunction with driveways and may require additional right-of-way. The lane length must be determined on a case-by-case basis and must be approved by the City Engineer.
2. Deceleration lanes are required when all of the following factors are determined to apply:
  - a. At least 5,000 vehicles per day are using or are expected to be using the street.
  - b. The 85th percentile traffic speed on the street is at least 35 miles per hour; or 45 miles per hour for a two lane (one lane each direction) roadway.
  - c. At least 30 vehicles will be making right turns into the driveway during a one-hour period.

#### 4.1.5 Sidewalk Areas

Developers are encouraged to enhance visual quality of sidewalk areas by the use of detached sidewalks adjacent to streets. Sidewalks to remain within City's Right-of-way or within an easement.

#### 4.1.6 Bridges, Retaining Walls and Structural Clearances

##### A. Bridges

1. Bridge Roadbed Width  
The clear width of all bridges, including grade separation structures, shall equal the full width of the physical improvements consisting of sidewalk, street, median, and curb and gutter.
2. Approach Guardrail  
If a vehicular railing or safety-shaped barrier is provided which is within 10 feet of a traveled way with or without a sidewalk, approach guardrails shall be installed on all approach ends in accordance with AASHTO guideline and paragraph 4.1.6.A.4.d. below.

3. Cross Slope

The crown is normally centered on the bridge except for one-way bridges, where a straight cross slope in one direction shall be used. The cross slope shall be the same as for the approach pavement.

4. Railings

The railings to be used are the State of Arizona Department of Transportation standard design railings. There are four types of railings, which are described below:

a. Vehicular Barrier Railings

- (1) The primary function of these railings is to retain and redirect errant vehicles.

b. Combination Vehicular and Pedestrian Railings

- (1) These railings perform the dual function of retaining both vehicles and pedestrians on the bridge. They consist of two parts:
  - a concrete barrier railing with a sidewalk
  - a metal hand railing or fence-type railing

c. Pedestrian Railings

These railings prevent pedestrians from accidentally falling from the structure and, in the case of the fence-type railing, prevent objects from being thrown to the roadway below the bridge.

d. Bridge Approach Railings

- (1) Approach railings are required at the ends of bridge railings exposed to approach traffic. On divided highways, with separate one-way traffic structures, they shall be placed to the left and right of approach traffic.
- (2) On two-way roadbeds with a clear width less than 60 feet across the structure, approach railings shall be placed on both sides of the structure.

- (3) When the clear width is 60 feet or more, approach railings shall be placed only to the right of approach traffic.
- (4) Several types of approach railings are available, including Metal Beam Guardrail, Bridge Approach Guardrail (Types I and II), and Safety-Shape Barriers. The type of approach railing selected should match the rail to be used on the bridge. When long runs of guardrail (such as embankment guardrail) precede the bridge, the guardrail should connect to the bridge railing and thus serve the approach railing function.
- (5) Approach railings shall be flared at their exposed end. The greatest flare offset possible should be used commensurate with the approach roadway. For detailed information, refer to the AASHTO publication, Roadside Design Guide.

## B. Retaining Walls

### 1. Types and Uses

Recommended types of retaining walls include reinforced concrete and structural masonry. Heavy timber construction is not encouraged except when approved by the City Engineer. The walls shall also include integral attachments for railing and weep drainage where applicable.

### 2. Aesthetic Considerations

- a. In general, the materials and design of retaining walls shall match or blend with the adjacent natural features, landscaping, and / or buildings. The surface of the retaining wall should have a low light reflectance. Suggested surface treatments include exposed aggregate, stucco or mortar wash, and native stone, or other surfaces as approved by the Development Review Board.
- b. The height of retaining walls shall not exceed 6 feet except when approved by the City Engineer. If approved to retain above 6 feet, terracing is encouraged and the length of the

alignment of the retaining walls should be foreshortened by vertical grooves, periodic offsets, and height changes, or other configurations as approved by the Development Review Board.

3. Safety Railings

A safety railing is required on or adjacent to vertical faces such as retaining walls, wing-walls, abutments, etc., and where the vertical fall is 2 feet or more. The safety railing shall be constructed per City of Goodyear standard details and shall be placed on top of the vertical face structure of the vertical drop.

C. Structural Clearance

1. Horizontal Clearance

- a. A fixed object other than street lights, signal poles, utility boxes and utility poles, will not be allowed within 10 feet of the traveled way unless approved by the City Engineer and a safety barrier is provided.
- b. A lesser clearance may only be allowed when other controls make the desired clearance unreasonable and appropriate traffic barriers are installed. In no case shall a fixed object be allowed within 2 feet of a traveled way.
- c. The horizontal clearance to bridge piers, abutments, and retaining walls on all streets shall be not less than 10 feet from the edge of the traveled way.

2. Vertical Clearance

- a. The minimum vertical clearance shall be 16.5 feet over the entire width of the traveled way of an arterial street or major collector street.
- b. On other streets, the minimum shall be 14.5 feet. Exceptions must be submitted to, and approved by, the City Engineer.

4.1.7 Side Slopes

A. Side Slope Standards

Side slopes should be designed for functional effectiveness, ease of maintenance and pleasing appearance.

1. For areas greater than 10 feet back of curb, slopes of 4:1 or flatter shall be provided.
2. Steeper slopes may be approved in areas more than 30 feet back of curb when soils are not highly susceptible to erosion, or when a cut is not more than 4 feet.
3. Consult the AASHTO publication, Roadside Design Guide for further details. Cuts or fills greater than 4 feet must be reviewed by the Development Review Board.

B. Slope Rounding

The top of all cut slopes shall be rounded where the material is other than solid rock. A layer of earth overlaying a rock cut also shall be rounded. The top and bottoms of all fill slopes for, or adjacent to a traveled way, sidewalk, or bicycle path shall also be rounded.

4.1.8 Construction of Less Than Ultimate Cross-Section Improvements

- A. A full street cross-section is required for the interior streets of a development and a complete half-street cross-section for the perimeter streets.
- B. If the street is a major arterial, four of the six lanes of the full street or two of the three lanes of the half-street may be required.
- C. The determination as to whether the unconstructed lanes will be on the outer edge of the cross-section or adjacent to the median location will be made on a case-by-case basis and approved by the City Engineer.

4.1.9 Construction of Half-Streets

Construction of half-street are discouraged and shall only be permitted with written approval in a Development Agreement.

4.1.10 Pavement Transitions

When development causes the widening of a portion of the pavement of an existing road, pavement transitions are required at each end of the widened portion. Design of the various features of the transition between pavements of different widths should be consistent with the design standards of the superior facility. The transitions should be made on a tangent section whenever possible. Locations with horizontal and vertical sight distance restrictions should be avoided. Whenever feasible, the entire transition should be visible to the driver of a vehicle approaching the narrower section. Intersections at grade within the transition area should be avoided.

- A. Transition to a Wider Pavement Section  
A transition from a narrower cross-section to a wider cross-section shall have a length that is five times the street design speed in miles per hour. See Detail G-3214.
- B. Transition to a Narrower Pavement Section  
A transition from a wider cross-section to a narrower cross-section shall have a length equal to the difference of the two widths in feet times the street design speed in miles per hour or the 85th percentile speed in miles per hour, whichever is greater. Detail G-3214 illustrates this requirement.

#### 4.1.11 Subdivision Street Planning

Subdivision street plans should produce the minimum number of intersections and wash crossings, and discourage through traffic. The following paragraphs describe certain other concepts and requirements.

- A. Existing and Proposed Streets  
Existing streets and proposed streets of the applicable Master Circulation Plan, should be incorporated into the design of new subdivisions. Exceptions shall be approved by the Engineering Department and may require the approval by the Development Policy Committee.
- B. Street Abandonment  
An existing street may be abandoned if it is not a street indicated in the Circulation Element of the General Plan or an Area Plan and will not eliminate reasonable access to existing properties. The abandonment must occur prior to the submittal of a final plat to the City Council.
- C. Cul-de-Sac Street Lengths  
A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system.
  - 1. The following requirements apply to both public and private streets.
    - a. The length of a cul-de-sac is measured between the centerline of an intersecting street and the radius point of the cul-de-sac.
    - b. A cul-de-sac street shall not be longer than 1,500 feet and it shall not serve more than 25 single-family dwelling units.

D. Dead-End Streets

1. Dead-end streets will be required where a street connection is necessary to serve adjacent properties that will develop at a future date.
2. When a dead-end street is required and it serves more than four lots, a temporary cul-de-sac shall be provided. In addition, the minimum/maximum length of a dead-end street shall be the same as that of a cul-de-sac street.

E. Bubbles

Bubbles are areas on the roadway expanded to provide a turn-around and additional access or lot frontage on minor collector and local streets.

1. Bubbles are required at intersections where each street extends in only one direction from the intersection.
2. Bubbles are permitted between intersections to improve accessibility to odd-shaped sites or on minor collector streets where direct access is not permitted.
3. The use of bubbles (except for a cul-de-sac) on other than local residential streets must be approved by the City Engineer.
  - a. Radii appropriate for these bubbles will be established as part of that approval.

F. Alleys

Alleys are not permitted in residential development in City of Goodyear.

G. Offset Intersections

1. Street jogs with centerline offsets less than 250 feet shall not be permitted along arterial and major collector streets, or on minor collector and local commercial and industrial streets where interlocking left turns will occur.
2. Offsets as small as 125 feet are allowed on minor collector and local commercial and industrial streets where interlocking left turns will not occur and on local residential streets.

H. Intersecting Tangents

A tangent section of roadway is desirable prior to an intersection on a curvilinear street. Minor street intersections with major streets shall have a minimum tangent outside the intersecting right-of-way.

4.1.12 Standards for a Development

A. Preliminary Design Report for Development

A preliminary design report shall be submitted prior to or at the time of preliminary plat submittal. At a minimum, the preliminary report must address the following subjects:

1. Vehicle Trip Generation
2. Roadway Classification
3. Design Speeds
4. Auxiliary and Additional Lane Requirements
5. Parking Requirements
6. Pedestrian, Bicycle, and Equestrian Requirements
7. Special Features and their Influence

4.1.13 Technical Reports

A. Traffic Impact

Developers are responsible for submitting a "Traffic Impact Analysis for Proposed Development", as outline in ADOT Publication 35-209, and a traffic circulation study.

B. General Information

1. Developers are responsible for submitting a Design Study Report to validate the design shown on the construction plans. The Design Study Report should not be excessively long or complex. Rather it is to briefly: describe the basis of the design and the assumptions made; explain "special" solutions to problems encountered; etc.



2. The following sections shall be contained in the report.
  - a. Soils Report  
A "Soils Report" shall be submitted with new street construction plans indicating "R" value, sieve analysis, plastic index of the subgrade, and street structural cross section design.
  - b. Drainage Report  
A "Drainage Report" shall be submitted with new street construction plans and/or the grading plans. This report shall be prepared per Chapter 4.0 and the "Storm Drainage Collection and Retention Manual".
  - c. Pavement Evaluation Report
    - (1) A "Pavement Evaluation Report" shall be submitted with new street construction plans when it is proposed to match existing pavement. The design engineer is responsible for investigating and evaluating the existing pavement structure.
    - (2) If the existing pavement does meet requirements, it may be matched by trimming a minimum of one (1) foot for a longitudinal match, or two (2) feet for a perpendicular match. Exact point of matching and method of trimming (sawcut or wheelcut) shall be determined in the field by the City.
  - d. Supplemental sketches, details, calculations, and design rational.

#### 4.1.14 Technical Design Requirements By Street Classification

- A. Design shall conform to Section 15-3-3 of the Street Design of the Subdivision Regulation. Copies of the City of Goodyear Subdivision Regulations are available at the City of Goodyear Community Development Department, Planning and Zoning office.

#### 4.1.15 Construction

- A. All construction shall conform to the latest MAG Standard Details and Specifications together with the Goodyear Supplement to MAG.
- B. A right-of-way Construction Permit is required for all work within the right-of-way.

- C. A 100% Performance Bond or equivalent, as acceptable to the City, is required for all work within the right-of-way.
- D. All contractors working within the right-of-way shall provide the City with proof of insurance in a form and with limits of coverage acceptable to the City.
- E. All work within the right-of-way shall be inspected and approved by the City.
- F. All newly constructed public ways shall be kept barricaded and access denied to the public until such public way is accepted by the City and all traffic control devices are installed to the approval of the City.

#### 4.1.16 Radius to Back of Curb for the Return

Street Classification	Arterial	Secondary	Collector	Residential Interior
Arterial	35'	30'	20'	20'
Secondary	30'	30'	20'	20'
Collector	20'	20'	20'	20'
Residential Interior	20'	20'	20'	20'

#### 4.1.17 Traffic Signals

Signal poles bases and conduit with pull boxes, per the City of Goodyear details, shall be provided at all arterial and secondary street intersections. An approved traffic preemption device shall be installed on all new traffic signals.

Deviation from these standards shall be approved by the Public Works Director.

#### 4.1.18 Street Lights

##### STREET LIGHT STANDARD

STREET TYPE	LUMINAIRE	MIN AVE FC	HGT FT.	SPACING MIN/MAX	POLE SPACING
RESIDENTIAL	9,500	.3	35	190/210	(1) ONE SIDE
LOW VOLUME COLLECTOR	16,000	.3	35	190/210	ALTERNATING
HIGH VOLUME COLLECTOR	16,000	.3	35	200/200	MEDIAN
MINOR ARTERIAL	30,000	.7	35	175/225	ALTERNATING
MINOR ARTERIAL	30,000	.7	35	200/200	MEDIAN
MINOR ARTERIAL	50,000	.7	35	250/250	ALTERNATING
MAJOR ARTERIAL	30,000	.7	35	175/225	ALTERNATING
MAJOR ARTERIAL	30,000	.7	35	200/200	MEDIAN
MAJOR ARTERIAL	50,000	.7	35	250/250	ALTERNATING

Notes:

##### Residential Streets

- A. One light to be installed at intersections and head of tee intersections.
- B. Lights are to be installed in cul-de-sacs that are greater than 200 feet.

## 4.3 TRANSIT

### 4.3.1 Introduction

#### A. Purpose

1. This section documents transit facility guidelines for Goodyear public works projects and for developers working on projects that will impact the transit system. This includes projects that create high-activity centers such as shopping malls or high-density living areas.
2. Criteria are documented for locating bus stops and transit amenities such as bus benches and transit shelters. It includes street geometrics for bus bays, standard signage and review and submittal requirements. There is also a brief discussion on landscaping as it relates to transit amenities.
3. The guidelines consider the needs of the transit user, the bus operator, neighbors adjacent to bus stops and the general public.

#### B. Applicability

1. The information presented in this document is intended for use by engineers, developers and City staff.
2. These guidelines are generalizations applicable to most situations. They are not intended as detailed engineering solutions; each site will have its own unique set of needs. Rather, transit-related design solutions may need to be adjusted to fit specific sites and applicable codes.
3. Developers are responsible for obtaining all city approvals and permits necessary to complete the transit improvements.

#### C. Goals

1. The goal of these guidelines is to provide a clean, safe, comfortable and convenient environment for user of Goodyear's transit system and to provide developers a framework in which transit amenities are stipulated for new projects.

2. All transit improvements will be designed to meet the regulations set forth by the Americans with Disabilities Act (A.D.A.).

#### 4.3.2 Criteria For Bus Stop Locations

##### A. Bus Stop Specifications

1. Frequency of bus stops is dictated by the degree to which bus patrons are willing to walk to board a bus. The minimum standard for bus stop locations in Goodyear is at quarter mile intervals for residential areas and one-eighth mile intervals at all minor arterials.
2. In order to provide the greatest convenience and safety for passengers, bus stops are generally located as close to intersections as possible. This minimizes walking distance for transferring passengers and encourages the use of sidewalks. Far side stops, those located immediately past an intersection, are optimal for the following reasons:
  - a. Minimal interference with traffic flow
  - b. Minimal interference with intersection sight distance
  - c. Less likelihood of passengers crossing in front of a bus
  - d. Less conflict for automobile right turns
  - e. Less obstruction for vehicles entering the intersection from a side street
  - f. More effective re-entry for bus into the traffic stream
3. Near-side bus stops (those stops located immediately before an intersection) are considered when placement of far-side stops is not feasible or when that stop will be located near buildings with high volumes of transit riders. These types of stops may also be located where a high-volume bus transfer location would otherwise require a pedestrian crossing at a busy street.
4. On occasion a mid-block bus stop may be utilized to provide access to a major generator, but it is generally discouraged due to the likelihood that pedestrians would cross streets mid-block rather than at an intersection.

5. The location of a transit stop is generally 85 feet, plus or minus 25 feet from the curb of an unsignalized intersection and 120 feet, plus or minus 25 feet from a signalized intersection. The paved loading area should be clear of any obstructions.
6. Where a development or subdivision is walled-off from the street, steps should be taken to allow easy pedestrian access. This could include a pedestrian access path linking various sections of the development to the bus stop or a system of offset walls around developments which allow pedestrian passage.
7. All transit stop furniture must be placed outside the standard five-foot sidewalk. A minimum three foot clearance is required between transit components and fire hydrants, switch boxes, mail boxes, etc.

B. Accessibility

1. All transit facilities must comply with the applicable provisions of the Americans with Disabilities Act. In general, a 36" clearance is to be maintained between bus stop components to allow for maneuvering by wheelchairs. A minimum clear length of 96 inches (measured from the curb or roadway edge) and a minimum clear width of 60 inches (measured parallel to the roadway) shall be provided at transit locations where a lift or ramp is to be deployed.

4.3.3 Transit Amenities (as determined by City Council)

Construction shall be in accordance with adopted Council Action or Policy per five year Capitol Improvement Plan.

- A. Comfortable and secure passenger waiting areas should be provided at as many bus stops as feasible. The waiting areas may include a varying range of improvements depending upon ridership and specific needs. Below are typical transit amenities and conditions under which they should be employed.

- B. Advertising signs are not allowed by city ordinance.

1. Benches

- a. Benches are located at bus stops where the concentration of waiting passengers is not sufficient to warrant provision of a bus shelter.

- b. Several styles of benches have been approved for placement in Goodyear. Specialty benches are used in downtown Goodyear. A plastic-coated blue bench with matching trash receptacle is used in all other areas.

## 2. Shelters

- a. Shelters are located at bus stops where studies show a concentration of waiting passengers at exposed locations. Shelters are appropriate along arterial or collector streets, or adjacent to high-activity centers. In a development, any requirement for bus shelters may be waived if adequate exterior shading and architectural shelter is provided by the developer.
- b. Shelters should be arranged with consideration to the sun's angles. Coverage should allow for maximum shade during the peak use hours of the summer morning and afternoon. The shelter should be oriented, however, to allow the bus driver clear visibility of the passenger and allow passengers a view of oncoming traffic.
- c. Goodyear has a standard shelter design. Plans and specifications are available upon request from the Public Works Department. Other shelter designs may be used provided it is approved by the City and the Development Policy Committee. Shelter designs must meet the following criteria:
  - (1) Minimum canopy of 65 square feet with a minimum width of 5.5 feet
  - (2) Minimum 7 feet clearance between underside of roof and sidewalk surface
  - (3) Shelter canopy will be waterproof with provisions for drainage away from transit users
  - (4) Seating areas will be shaded
  - (5) Provide security for transit passengers

- (6) Have a minimum 6 inches vertical clearance from the sidewalk to avoid collection of trash and debris
- (7) Trash receptacle with a minimum capacity of 30 gallons
- (8) Fixed components to prevent unauthorized removal
- (9) Materials will allow for air circulation and avoid containment of hot air
- (10) Materials must be finished to prevent overheating
- (11) Canopy materials that collect and radiate heat will be insulated
- (12) Minimum of 6 linear feet of seating located under the shelter canopy
- (13) Materials, coatings and surfaces will be graffiti resistant
- (14) Components of the shelter will be readily replaceable
- (15) Colors respond to the architectural character of the development and the transit system (Per review and approval of the Development Policy Committee)
- (16) Transit information holder will be placed in a well-lit portion of the shelter
- (17) Bus Stop graphics per City requirements
- (18) Minimum two foot clearance between roof canopy and face of curb

C. Bus Bays (Pullouts)

- 1. Bus bays enable buses to pull completely out of the traffic lane while loading and unloading passengers.



2. Two types of bus pullouts are allowed:
  - a. Far-side
    - (1) Far-side pullouts reduce walking distances for bus transfers and encourage patrons to use intersection crosswalks.
  - b. Mid-block
    - (1) Mid-block pullouts occur between intersections or when a physical obstruction prevents the placement of a far-side pullout.

D. Park and Ride lots

1. Park-and-ride lots provide free automobile parking and allow patrons convenient access to public transit. These facilities may be combined with transit centers or major transfer centers. They are also found at shopping malls and near large employment centers.
2. The purpose of park-and-ride lots is to intercept automobile trips close to their origin and to transfer patrons to buses for the remaining portion of the trip.
3. Park-and-ride lots should be located in conformance with the Goodyear Transportation Master Plan. Additionally, these lots should be located at express bus route stops at major activity centers.

E. Major Transfer Centers

1. Major transfer centers are high capacity transfer destination points where several buses converge. These facilities provide a convenient location for bus passengers to transfer between routes. They also typically provide direct pedestrian access to major activity centers.
2. Transit centers include permanent facilities with a high level of transit amenities such as shelters, bike lockers, drinking fountains and information kiosks. They may be constructed off-street to include a bus turn-around loop or on street where major transfer activity occurs between intersecting or converging bus routes.

3. Criteria for locating major transfer centers are:
  - a. Where regional and local bus routes intersect or
  - b. At transfer points between two or more regional bus routes
  - c. Near crossings of major arterial streets
  - d. Adjacent to or in major activity centers
  - e. At park-and-ride lots which are located in areas meeting one of the above criteria
4. Transfer centers, or transit centers as they are also known, are typically a minimum of 1.5 acres and accommodate at least 45 parking spaces.
5. Refer to the Goodyear Transportation Master Plan for proposed locations for both transit centers and park-and-ride lots.

F. Landscaping

1. Shade trees and other protective landscaping should be provided wherever possible. This landscaping could be considered part of the development's frontage landscape and could count towards any landscaping requirements which may apply. Considerations for selection and location of landscaping include:
  - a. Trees should be mature and have an adequate canopy to shade the seating area
  - b. Low-water consumption trees and shrubs should be used
  - c. Tree location should consider the solar orientation of the transit stop. Priority should be given to shading afternoon summer sun
  - d. Transit landscaping should be compatible with other frontage landscaping
2. All landscaping shall be carefully located so as not to obstruct the visibility of either the transit user or the bus operator. The developer/property owner shall be responsible for the maintenance of landscaping at bus stops.

#### 4.3.4 Signage

##### A. Bus Stop Signs

1. The placement of bus stop signs is an important passenger convenience, operations and marketing tool for transit systems. Bus stop signs are positioned to notify passengers that the bus will stop at that specific location. They serve as a reference for bus operators and as a point of identify for the transit system.
2. The bus stop sign is generally not a traffic sign (except as noted below) since it is not displayed to regulate or warn motorists.
3. A regional bus stop sign is currently in use throughout the Valley. The sign is 18" wide by 24" high, reflectorized for nighttime visibility and is double-faced so that it can be seen from both directions. The upstream side of the sign may contain "No Parking" information for motorists approaching the bus stop.
4. The standard regional sign identifies a location as a bus stop and includes the name and number of the bus route(s) being served and the transit information telephone number.

##### B. Sign Placement

1. Bus stop signs must be placed at the location where people board at the front door of the bus. In cases where the bus stop sign is incorporated into the design of a transit shelter, the need for a separate sign is diminished.
2. Ideally, bus stop signs must be placed at the location where people board at the front door of the bus. In cases where the bus stop sign is incorporated into the design of a transit shelter, the need for a separate sign is diminished.
3. Bus stop signs should be installed on sign posts or metal poles so that the sign is "flagged". In other words, the sign should be attached to the post by its edge. This allows both sides of the sign to be viewed without obstruction. The bottom of the sign should be seven feet above ground level, at least two feet from the curb face and away from obstructions such as landscaping or other signs. The standard regional sign has been designed so that it may be mounted by its edge to a two inch post without obscuring

the backside message. Where metal street light poles are at the proper location by too close to the curb, the signs may be flagged away from the street.

#### 4.3.5 Bus Stop Maintenance

- A. Well maintained bus stops are crucial to the image of the transit system. Damaged furniture and trash build-up should be tended to immediately to create a positive impression for transit patrons and the general public.
- B. Regular maintenance should include:
  - 1. Full wash down of shelter and accessories
  - 2. Removal of all dirt, graffiti, and pasted material
  - 3. Litter pick up around stop or shelter/accessories to a distance of ten (10) feet
  - 4. Manual or chemical removal of weeds
  - 5. Pruning of obstructing tree growth
  - 6. Touch up of paint scratches
- C. The developer shall maintain the bus stop for a two (2) year period. Repair of items that pose a safety problem should be performed within twenty-four (24) hours. Repairs that do not pose safety problems should be completed within three (3) days.

#### 4.3.6 Submittal Requirements and Review Procedures

- A. The following facilities must be delineated on the preliminary site plan or the preliminary plat submitted to the city:
  - 1. Major transfer centers
  - 2. Bus stops
  - 3. Park-and-ride lots
  - 4. Bus bays
  - 5. Shelters
  - 6. Bus benches
- B. The design and location of the above mentioned facilities must be approved by the City during the development approval process.

- C. Developers may deposit funds in lieu of construction and installation of stipulated transit amenities. The amount of funds to be deposited are determined during the project review process and are in force upon City Council approval of the project.

## 4.4 BIKEWAYS

### 4.4.1 Introduction

#### A. Preface

1. These Design Standards and Policies as presented in this section are derived primarily from the “Arizona Bicycle Facilities Planning and Design Guidelines as prepared by the Facilities Planning Committee, Arizona Bicycle Task Force, November 1, 1988. Additional references include the Guide for the Development of Bicycle Facilities (AASHTO) August 1991, and the Manual of Uniform Traffic Control Devices (MUTCD).

#### B. Purpose

1. This Section has been prepared for development and improvement projects, both private and public, within the City of Goodyear. The use of this Section will assist in establishing uniform bicycle facilities in Goodyear and throughout the region, and will be in conformance with Federal and State Highway Administration Guidelines.

#### C. Philosophy

1. The City of Goodyear, in compliance with the Arizona Revised Statutes (ARS 28-812) recognizes the bicycle as a vehicle and is therefore entitled to share the roadway with other vehicles, except where expressly prohibited.

#### D. General Plan Circulation Element

1. The current Circulation Element of the General Plan, as adopted by the Goodyear City Council, is designed to provide for the safe and efficient movement of people and goods in the City. The Bicycle Facilities Plan is a major section of the Circulation Element and should be used as a reference.

#### E. Definitions

1. Bikeway: Any road, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

2. Bicycle Lanes: A portion of the roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists.
3. Bicycle Routes: Shared facilities to provide continuity to other bicycle facilities (usually bike lanes) or to designate preferred routes through high demand corridors (Routes may be signed but not striped).
4. Bicycle Path: Physically separated from motor vehicle traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way.

#### 4.4.2 Location Criteria

##### A. Accessibility

1. Bicycle facilities should be located along a route where use can be maintained.
2. Strong consideration should be given to access points (more frequent and convenient will increase usage).
3. Bikeways should serve activity centers along a direct course.
4. Barriers such as freeways, canals, railroad tracks, etc., should be avoided or corrected with proper facility crossings.
5. Routes should be developed that minimize delays for the cyclist.
6. Stop signs should be oriented to restrict cross traffic rather than the bike route.

##### B. Safety

1. Bike paths and pedestrian paths should be separate, per Arizona Bicycle Facilities Planning and Design Guidelines and COG Details.
2. Two-way paths immediately adjacent to a roadway should be discouraged.
3. Sidewalks should be used only under very special conditions.

4. Bicycle lanes should be one-way and in the same direction as vehicular traffic.
5. Bicyclists are required by Arizona Statutes to follow all “rules of the road”.
6. Traffic volumes must be considered for on road bicycle facilities.
7. Truck and bus traffic should comprise less than 5% of roadway volumes for bike routes (5% may be exceeded for bike lanes).
8. Roadways should have a smooth surface, but not slick. Utility covers and drainage grades should be flush with grades designed to allow crossing.
9. Ease of maintenance must be included in the design process.
10. High density and turnover of on-street parking should be avoided.

C. Security

1. Bicycle parking devices should be provided at both the trip origin and destination that provide for protection from theft and damage. Long term and short term facilities should be considered depending on destination use (i.e., work, library, etc.).

D. Riding Environment

1. Air quality should be considered and roadways with heavy, slow traffic should be avoided.
2. Scenic value is particularly important along a recreation use bike path.
3. Steep grades greater than 6% uphill should be avoided.



#### 4.4.3 Selection Criteria

##### A. Bicycle Paths

1. Paths should be used to serve corridors not served by streets and highways.
2. Paths should offer opportunities not provided by the road system.
3. Paths can provide a recreational opportunity, or a high speed commuter route.

##### B. Bicycle Lanes

1. Designed for preferential or exclusive use of bicyclists.
2. Should be established along streets with significant bicycle demand.
3. Special effort should be made to ensure that appropriate levels of service are maintained including sweeping, lane markings and lighting where required.
4. The four foot minimum width should be exclusive of curb and gutter.

##### C. Bicycle Routes

1. Routes are shared facilities and should be developed to provide continuity with other bicycle facilities or as designated preferred routes through high demand corridors.
2. Routes are usually signed but do not require striping.

##### D. Wide Curb Lanes

1. These are placed along streets in corridors where there is significant bicycle demand on major arterial streets, and are unmarked and unsigned.
2. Wide curb lanes are appropriate where traffic speeds and volumes are tolerable for shared roadway facilities.

E. Shared Roadway (No Bikeway Designation)

1. Streets and highways that may be inherently unsafe for bicycle traffic and inappropriate to encourage additional bicycle traffic.

4.4.4 Design Criteria

A. Roadway Improvements

1. On new roadways curb inlets should be used and drainage grates and covers should be kept out of cyclists' path.
2. Railroad highway grade crossings should ideally be at a right angle to the bicycle facility. Consideration must also be given to the materials on the crossing surface and to the flangeway depth and width.
3. Pavements should be free of holes and bumps and other surface irregularities. Joints should be filled and pavement edges should be uniform and void of "drop-offs". Edges should be level with pavement.
4. Consideration should be given to bicycle crossings when installing traffic control devices. Short clearance intervals should be avoided on multi-lane streets.
5. Wide curb and bicycle lanes are preferred over shoulders.
6. Rumble strips should not be installed on streets designed for bicycle traffic.
7. Wide curb lanes should be 15 feet with 12 foot travel lane and 14 feet with 11 foot travel lane, exclusive of curb and gutter, and the pavement edge should be striped to avoid the operation of two vehicles in one lane.

B. Bicycle Routes

1. Routes should be marked as connectors to other bike facilities and as touring routes. It is desirable to furnish sign information for directional changes and for distance marking for long routes.

C. Bicycle Lanes

1. Lanes should always be on-way and flow in the same direction as adjacent motor vehicle traffic.
2. Lanes should be considered when it is desirable to delineate the rights-of-way assigned to bicyclists and motorists.
3. Lanes may include striped lanes on roadway, use of emergency parking lanes or use of paved shoulders.
4. The minimum desirable bike lane is 4 feet.
5. It is preferable to place bike lanes on the right side of one-way streets.
6. Raised barriers or pavement markers shall not be used to delineate bike lanes.

D. Bicycle Paths

1. Bicycle Paths are facilities on exclusive rights-of-way and with minimal cross flow by motor vehicles.
2. The desirable minimum paved width for a bike path is 8 feet. A two foot minimum graded area should be maintained on each side of the path.
3. In general, the minimum design speed for a paved bicycle path is 20 mph, however, this speed should be substantially less in areas of multiple use, high traffic volume and unpaved surfaces.
4. "Speed bumps" should not be used.
5. Grades should be 5% or less, particularly on long inclines.
6. Sight and stopping distances are important considerations in the design of bicycles paths.
7. Intersections present difficult design considerations, and those with the most favorable conditions should be selected. The ideal intersection design is a grade separation.
8. Signing must be included in the design criteria for both regulatory and informational purposes. General guidelines

for markings are provided in the Manual of Uniform Traffic Control Devices, specifically Part IX.

9. Pavement markings for bicycle paths (and lanes) should follow the same general guidelines as for road markings with particular attention given to non-slip treatment.
10. Pavement selections for bicycle paths should be selected similar to highway selections, with particular care to edges which may be used for emergency or maintenance vehicles. Broom finish or burlap drag concrete surfaces are preferred over trowel finishes.

E. Multi-use Paths

1. In general, multi-use paths and sidewalks are undesirable, and when possible, should be separated from bicycle paths.
2. Motor vehicle use is limited to maintenance and emergency vehicles only.
3. Fixed lighting is highly desirable on paths that may be used at night, for underpasses, at intersections and in areas where security may be a problem.

4.4.5 Traffic Controls

A. Requirements

1. Traffic control devices for bicyclists must adhere to the same five basic requirements as for motorists:
  - a. Fulfill a need
  - b. Command attention
  - c. Convey a clear, simple meaning
  - d. Command respect of users
  - e. Give adequate time for proper response
2. Traffic control devices shall be placed by the City of Goodyear only.

3. The use of colors should conform to code specifications for signs and markings:
  - a. YELLOW - General Warning
  - b. RED - Stop or Prohibition
  - c. BLUE - Service Guidance
  - d. BROWN - Recreation and Scenic Guidance (may be stipulated by the city)
  - e. BLACK - Regulation
  - f. WHITE - Regulation
4. The Uniform Vehicle Code and Model Traffic Ordinance published by the National Committee on Uniform Traffic Laws and Ordinances have provisions for bicycles and are used as the legal basis for control devices.
5. See Appendix A and D of the Arizona Bicycle Facilities Planning and Design Guidelines published by the Arizona Bicycle Talk Force for detailed information on design and placement of signs.

#### 4.4.6 Bicycle Parking

##### A. Long Term

1. Needed at locations such as employment centers and multi-family developments.
2. Facilities should be provided which secure the frame, both wheels and accessories, and which offer protection from the weather.
3. Bicycle lockers and attended storage areas are examples of long term parking facilities.

##### B. Short Term

1. Needed at locations such as shopping center, libraries, recreation centers, post offices, restaurants and other quick trip attractors.
2. Should be convenient and located near the building entrances or other highly visible areas.

3. Should be designed so that it will not damage bicycles.
4. Should allow for combined security of both wheels and frames.

#### 4.4.7 Operation and Maintenance

##### A. Responsibility

1. The agency responsible for control, maintenance and policing of the facility should be established prior to construction.
2. If the bicycle facility is part of the City of Goodyear's Bike Plan, an agreement will be developed between the City and the Developer outlining areas of responsibility.
3. Facilities should be maintained in accordance with provisions contained in other sections of these guidelines.
4. A regular schedule of maintenance should be established for the responsible agency, with provisions for emergency situations such as storms, floods and other natural disturbances, as well as for high participation and special use activities.
5. Appropriate maintenance is necessary for continued use of the bicycle facility.

## 4.6 TRAFFIC SIGNS AND MARKINGS

### 4.6.1 Introduction and Definitions

- A. This booklet has been prepared to present the criteria and procedures to be utilized by consultants when performing traffic signing and pavement markings design working and for the City of Goodyear.
- B. The following abbreviations apply herein:
  - 1. AASHTO - American Association of State Highway and Transportation Officials
  - 2. ADOT - State of Arizona Department of Transportation
  - 3. COG - City of Goodyear
  - 4. ITE - Institute of Transportation Engineers
  - 5. MAG - Maricopa Association of Governments
  - 6. MUTCD - Manual on Uniform Traffic Control Devices

### 4.6.2 Design Specifications

- A. The following publications or their current revisions are to be used in conjunction with the design criteria in this booklet when performing traffic signs and markings design work in the City of Goodyear.
  - 1. "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" - U.S. Department of Transportation, Federal Highway Administration, Current Revision.
  - 2. "SIGNING AND MARKING" - Standard Drawings, ADOT.
  - 3. "TRAFFIC CONTROL MANUAL FOR HIGHWAY CONSTRUCTION AND MAINTENANCE" - ADOT 1989.
  - 4. "POLICIES, GUIDE AND PROCEDURE MANUAL" - ADOT.

5. "SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - City of Goodyear.
6. "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - MAG.
7. "UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION" - MAG.

#### 4.6.3 Design Standards

##### A. General

1. Design shall be in accordance with the MUTCD unless modified by the City as noted herein.

##### B. Signing

1. All sign posts are to be 1-3/4 telespar.
2. "No Parking signs shall be R8-3a (12"x18") modified with a lower arrow plaque. They shall be placed approximately 350-400 feet apart on all arterial and collector street classifications 45 degrees to the curb.
3. Speed limit signs (R2-1) are to be installed at 4 per side per mile.
4. Stop signs (R1-1) are to be 30"x30" minimum size.
5. Street name signs in subdivisions must conform with City colors and standards.
6. Advance street name signs are to be installed at a height of 4 feet to the bottom of sign and placed so that they will not be obstructed by vegetation. Signs shall be installed in medians whenever possible.

##### C. Striping

1. All permanent pavement striping (lines and crosswalks) shall be 60 mil hot-sprayed thermoplastic. Temporary pavement markings shall be reflectorized traffic paint.
2. COG striping and marking standards are to be shown per MUTCD.



#### 4.6.4 Standard Plan Layout

##### A. General

1. Signing and pavement marking design shall be shown in the same plan view.
2. Plan sheets are to be complete and to scale 1" = 40' unless otherwise approved by the Public Works Director and the Plan Review Staff.
3. Entire length of project is to be shown in plan view. "Typical Sections" representative of striping and/or signing will not be accepted.
4. Signing and pavement marking plans shall include all existing signing and pavement markings for a minimum of 300 feet past the limits of constructions and shall include all transitions and tapers.
5. Right-of-way lines shall be shown and appropriately dimensioned.
6. Control points shall be stationed and clearly identified.

##### B. Standard Plan Sheet Notes

1. These notes along with any additional project specific notes shall be placed on the lead signing and pavement marking plan sheet.
  - a. All pavement markings, signing and construction shall conform to Arizona Department of Transportation standard drawings and specifications unless otherwise specified in the "Manual on Uniform Traffic Control Devices", latest edition.
  - b. Traffic control shall conform to the City of Phoenix, "Traffic Barricade Manual", and/or as directed by the City of Public Works Inspector.
  - c. Signs shall be installed on Telespar posts per COG Standard Detail No. G-3140.

- d. All signs that are removed and not reinstalled shall be salvaged and delivered to the Public Works maintenance yard at 200 S. Calle de Pueblo, Goodyear, Arizona.
- e. All lane striping, crosswalks and chevrons shall be 0.060" (60mil) hot sprayed thermoplastic, unless noted otherwise on the plans.
- f. All pavement symbol, arrows and legends shall be type I preformed pavement markings.
- g. Raised pavement markers shall be installed per COG Standard Detail No. G-3210 and ADOT Standard Drawing 4-M-2.02, with a City approved bituminous adhesive.
- h. All existing pavement markings which conflict with proposed markings shall be removed by sandblasting, or City approved method, prior to the installation of new pavement markings. Removals shall be to the satisfaction of the City Inspector.
- i. "No Parking" signs (R8-3a) shall be installed or reinstalled approximately every 350 feet along the length of the project, approximately 5 feet from the back of curb. Band to streetlight poles when feasible.

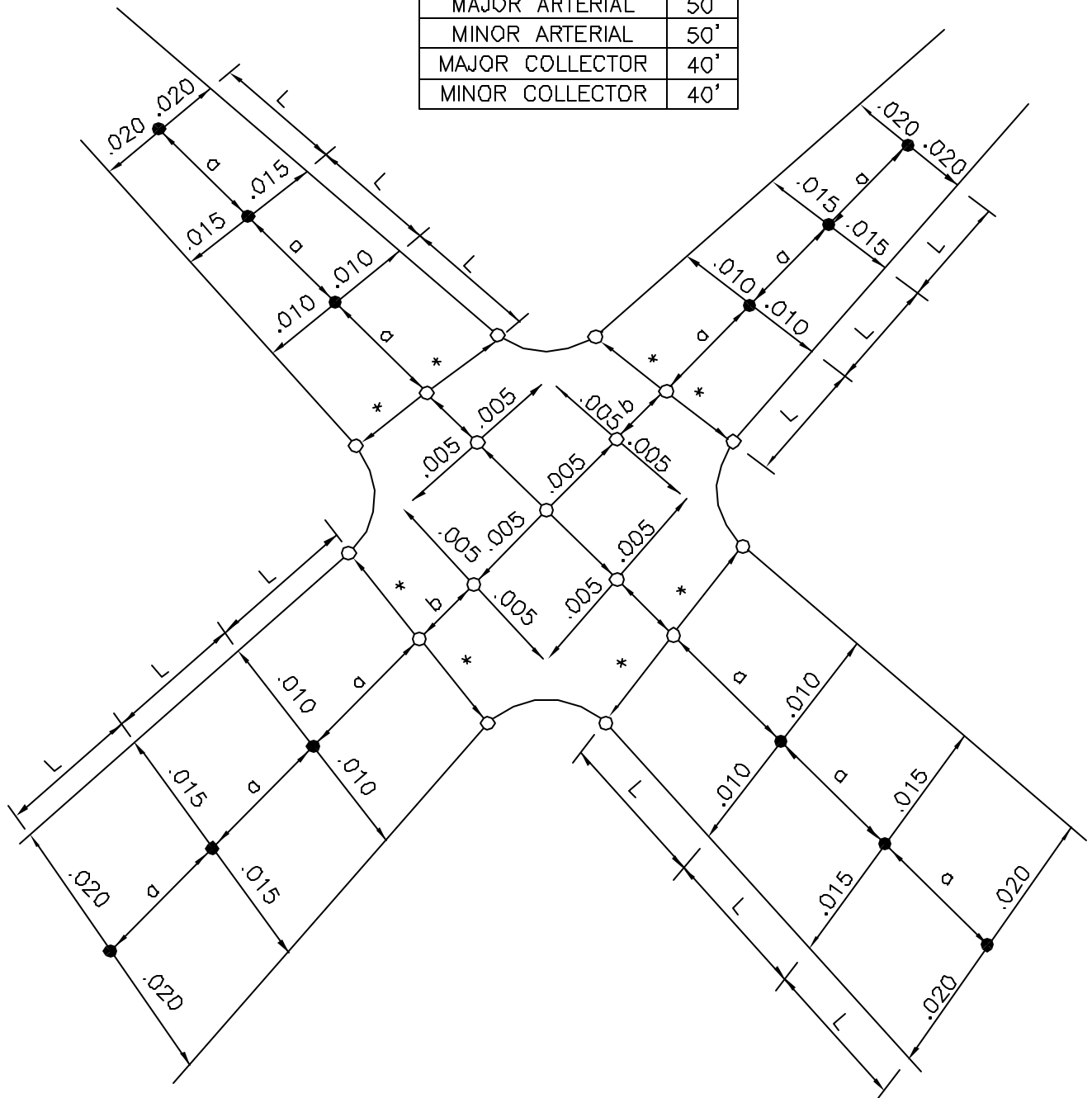
#### C. Signing

- 1. All signs shall be graphically depicted in the direction of travel.
- 2. All signs shall be stationed and referenced to the appropriate MUTCD sign designation with size noted.
- 3. Existing signs will be identified to remain, be removed or be relocated consistent with note 2 above.
- 4. Consultant shall field verify all existing advance or approach signing applicable to the project. Reference signs on plan sheet including location or station and note status of sign.

D. Striping

1. Existing striping shall be fully shown (as screened lines or lightly inked pen lines), identified by type and width, and completely dimensioned across roadway.
2. Raised pavement markers shall be graphically shown in plan view and referenced by construction notation.
3. All new striping shall be clearly identified noting color and line width.
4. All striping shall be fully dimensioned across roadway and tied to a construction centerline or monument line at each side of an intersection.
5. All pavement arrows, legends, crosswalks, etc. shall be located by station or dimension lines.

STREET TYPE	L
EXPRESSWAY	50'
MAJOR ARTERIAL	50'
MINOR ARTERIAL	50'
MAJOR COLLECTOR	40'
MINOR COLLECTOR	40'



### LEGEND

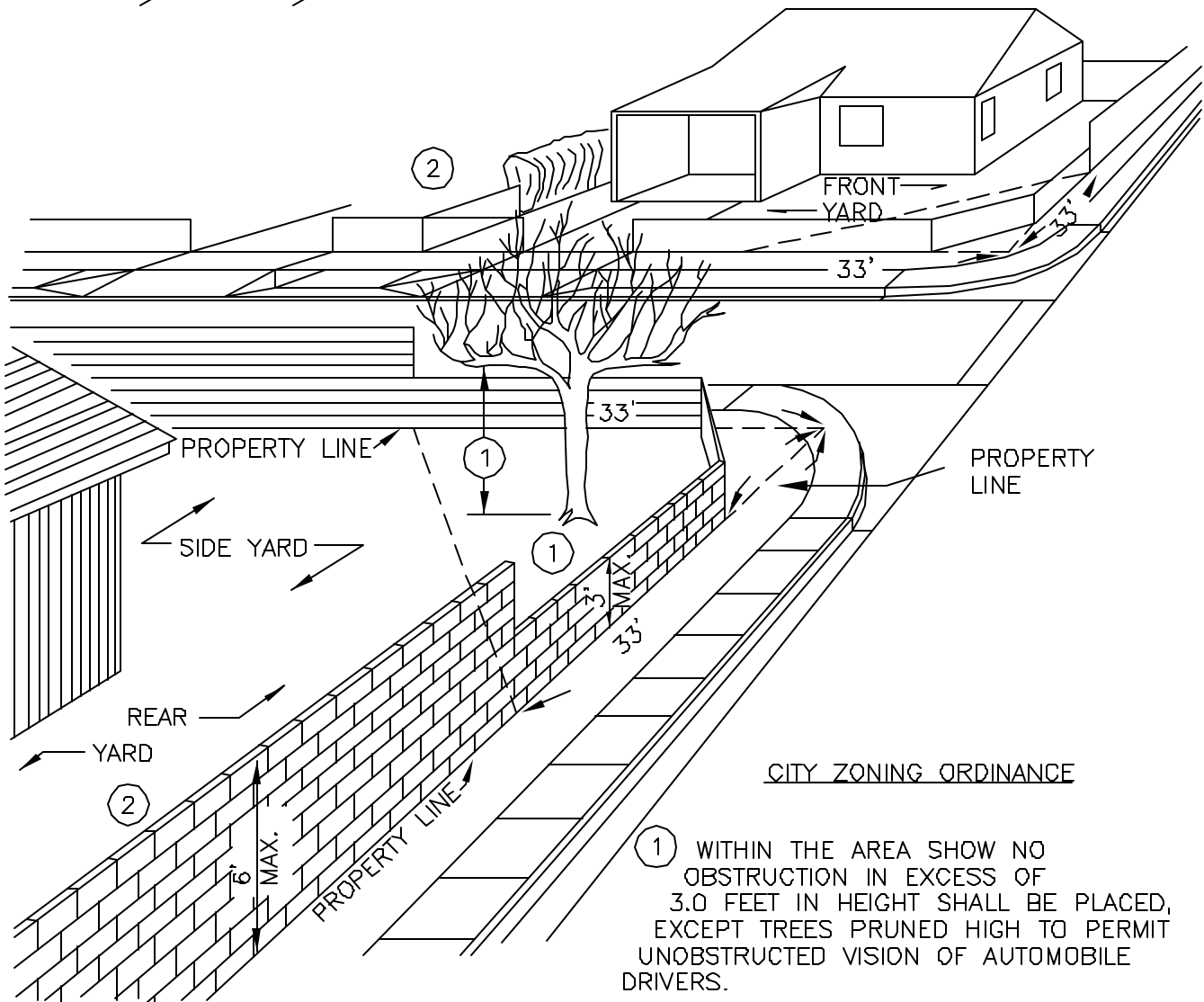
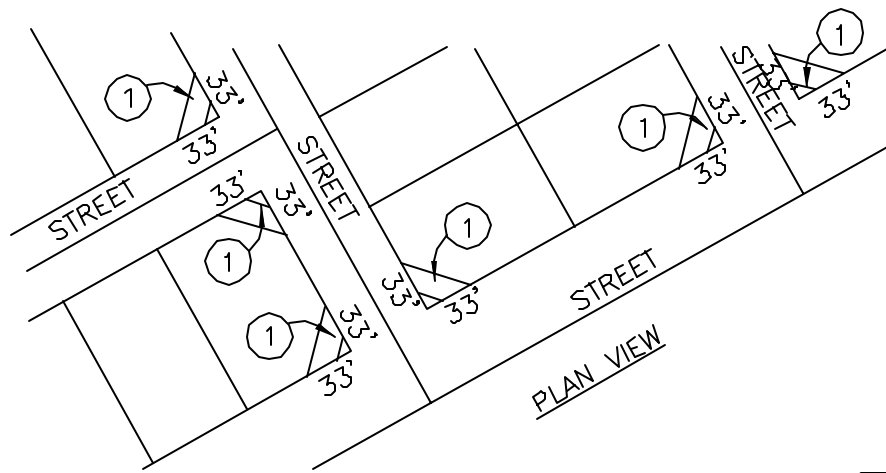
- = As required to match proportionate change
- - - = Normal centerline grade
- ↔ = Not to exceed .005 in either direction
- = Grade break greater than .01 may require vertical curve
- = Grade break not to exceed .01

	RESIDENTIAL		COMMERCIAL/ INDUSTRIAL	
	SINGLE FAMILY (1)	MULTI- FAMILY (2)	SINGLE BUSINESS (2)	MULTI- BUSINESS (2)
MIN. WIDTH ONE WAY (3)	12'	12'	16'	16'
MIN. WIDTH TWO WAY	24'	24'	24'	24'
MAX. WIDTH	30'	30'	30'	40'
MIN. SPACE BETWEEN DRIVES	n/a	40'	60'	100'
MAX. NO. OF DRIVES	2	2 PER FIRST 19 UNITS 3 PER 1200' FRONTAGE 4 PER 2600' FRONTAGE	2 PER STREET	1 PER 225' FRONTAGE 2 PER 600' FRONTAGE 3 PER 1200' FRONTAGE 4 PER 2600' FRONTAGE

- (1) MAG. STD. DET. 250
- (2) GOODYEAR, STD. DET. 251 SHALL BE USED WHERE WARRANTED BY SUFFICIENTLY HIGH DRIVEWAY USAGE IN THE JUDGEMENT OF THE CITY ENGINEER;  
OTHERWISE MAG STD. DET. 250 SHALL BE USED.
- (3) IF DRIVE IS ALSO FOR FIRE EQUIPMENT ACCESS THEN MIN. WIDTH SHALL BE 20'.

**NOTES:**

1. ALL DRIVEWAY WINGS OR P.C.'S WILL BEGIN 5' FROM SIDE PROPERTY LINE EXTENDED.
2. DRIVEWAY LOCATION AT INTERSECTIONS:
  - RESIDENTIAL DRIVEWAY WINGS MAY ABUTT, BUT NOT ENCROACH INTO, THE P.C. OF THE STREET CURB RETURN.
  - COMM./INDUST. DRIVEWAY ENTRANCE SHALL BE A MINIMUM OF 150' FROM INTERSECTING RIGHT OF WAY LINES ALONG OR ADJACENT TO ARTERIAL STREETS.



① WITHIN THE AREA SHOW NO OBSTRUCTION IN EXCESS OF 3.0 FEET IN HEIGHT SHALL BE PLACED, EXCEPT TREES PRUNED HIGH TO PERMIT UNOBSTRUCTED VISION OF AUTOMOBILE DRIVERS.

② MAXIMUM HEIGHT OF FENCE IN FRONT OF YARD SHALL BE 3.0 FEET. IN REAR OR SIDE YARD, THE MAXIMUM HEIGHT SHALL BE 6.0 FEET.